

Supporting Independently Living Seniors through ICT

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Session 2b – ICT for an Ageing society: Examples of what has been achieved so far and current work in pilot deployment and R&D

**Personal Health Systems - Deployment opportunities and ICT research challenges,
European Parliament, Brussels, 12-13/02/2007**

Background and Expertise



- 1) Support Unit for disabled students**
- 2) FORTEC - Research Group for Rehabilitation Technology**
 - Head: Wolfgang Zagler
 - Since 1986
 - Expertise: Research and Technical Development in area of Assistive Technologies, HCI for disabled and old persons, user involvement (user requirements, validation, field trials, ethics)

Content of this presentation

- **Examples of Supportive ICT systems**
 - SILC – An Extended Emergency Call System
 - ENABLE - Enable elderly people to live well
 - FRR – Intelligent Toilet System
 - Movement – Mobility Enhancement System
- **Current Work & Outlook**
 - Establishing Living Lab for Continuous User Involvement & Ethics
 - Pilots for upcoming FP7 proposals

EU R&D project SILC

- Title: SILC – Supporting Independently Living Citizens
- Duration: January 2001 until December 2003
- Aim: Personal Monitoring and Alarm System
- Funded in part by the EU in FP5 with 1.6 M€
total costs: 2.8 M €

SILC – Supporting Independently Living Citizens (2001-2003)

- The percentage of old and very old population is increasing in most European countries
- Most people want to live in their own home as long as possible
- Aim of the project SILC was to prolong the quality of life of older and of infirm people by postponing the need for institutionalisation.
- To achieve this, a portable wrist-worn life-signs monitor was developed by SILC consortium 2001-2003.



Setting the Scene

- Existing alarm phones for old citizens consist of
 - a remote controlled hands free telephone
 - a button on a wrist worn transmitter device has to be pressed manually to connect to service provider
 - Some devices provide some kind of dead man function and/or combination with fall detectors
- Problems reported by service providers:
 - old persons are often very reluctant to press alarm button
 - Often no sufficient motivation to carry the transmitter or fall detector day and night

Functional Ranking from User Panels

- 106 end users (70 primary, 36 secondary = carers) in Italy, Spain, Austria and UK:
 - Health status and fall detection (automatic monitoring)
 - Check call services and periodic contacts (personal communication)
 - Reminders for medication or periodic business (automatic reminder)
 - Remote control of door lock or household appliances (remote control)

This ranking (in priority order) was then used to draw up a technical specification and develop prototypes of the required system modules.

SILC – General Approach

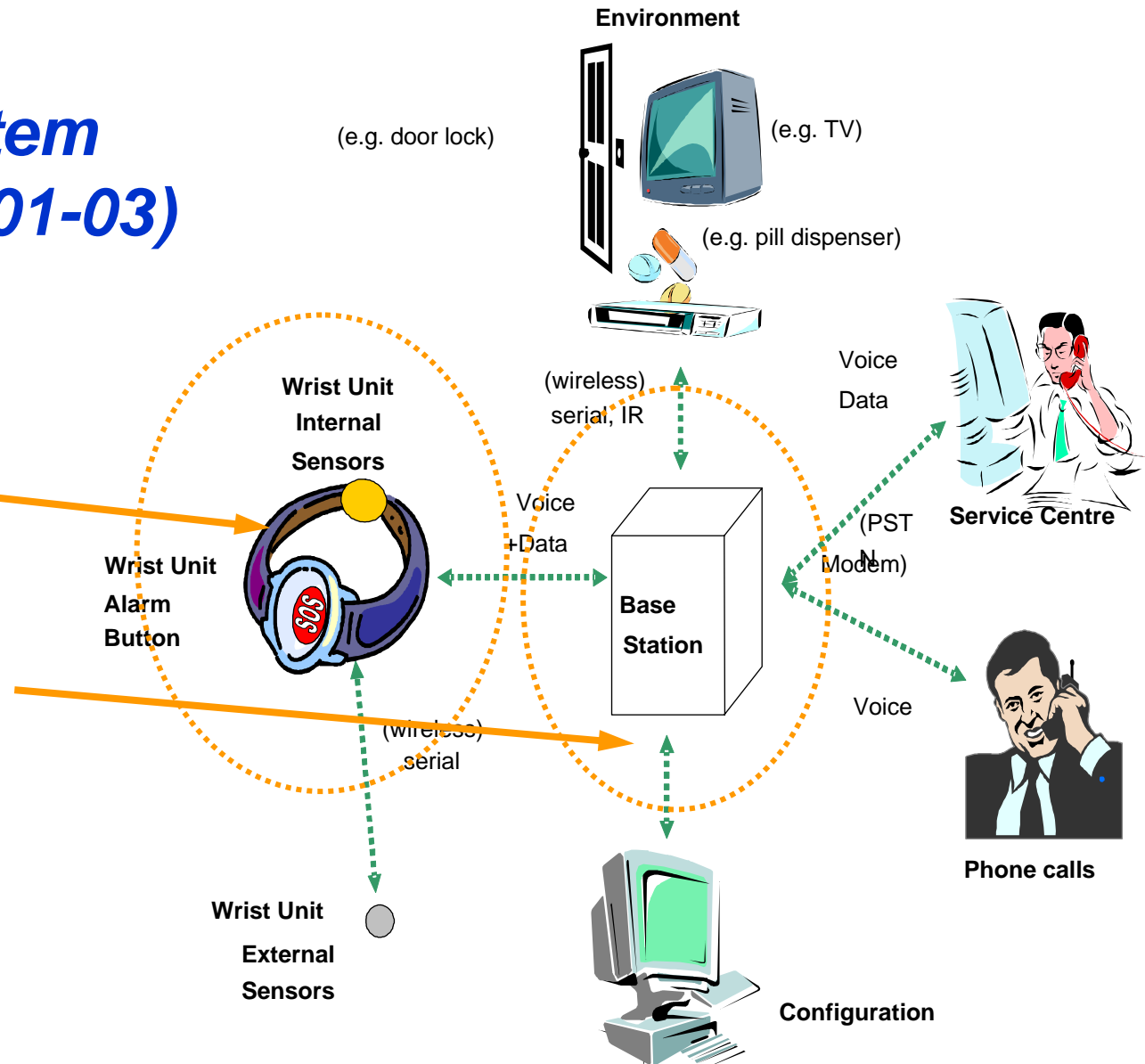
- A wrist-worn electronic device with integrated biometric sensors was developed.
 - An alarm-call is generated if parameters are out of range.
- The sensors monitor heart pulse rate, body temperature, spatial orientation and acceleration of the device, ECG signal etc.
- Additional features like
 - environmental control capabilities and PDA functions (clock, calendar, reminder for medication)
 - shall make the device indispensable for every day life.
- The device permits telephone conversations via the base station.

SILC - System Structure (2001-03)

Main parts:

Wrist Unit (WU)
(integrated sensors)

Base Station (BS)
linked to the
Service Centre (SC)



SILC Prototype of wearable device (2003)

- Kernel software and user interface (LCD, buttons, speaker...)
- Internal sensors (IR reflection pulse sensor, temperature sensing module and a 3-axis accelerometer)
- Connection for external sensors (ECG)
- Bluetooth connection to Base Station (up to 37m)
- External (!) battery

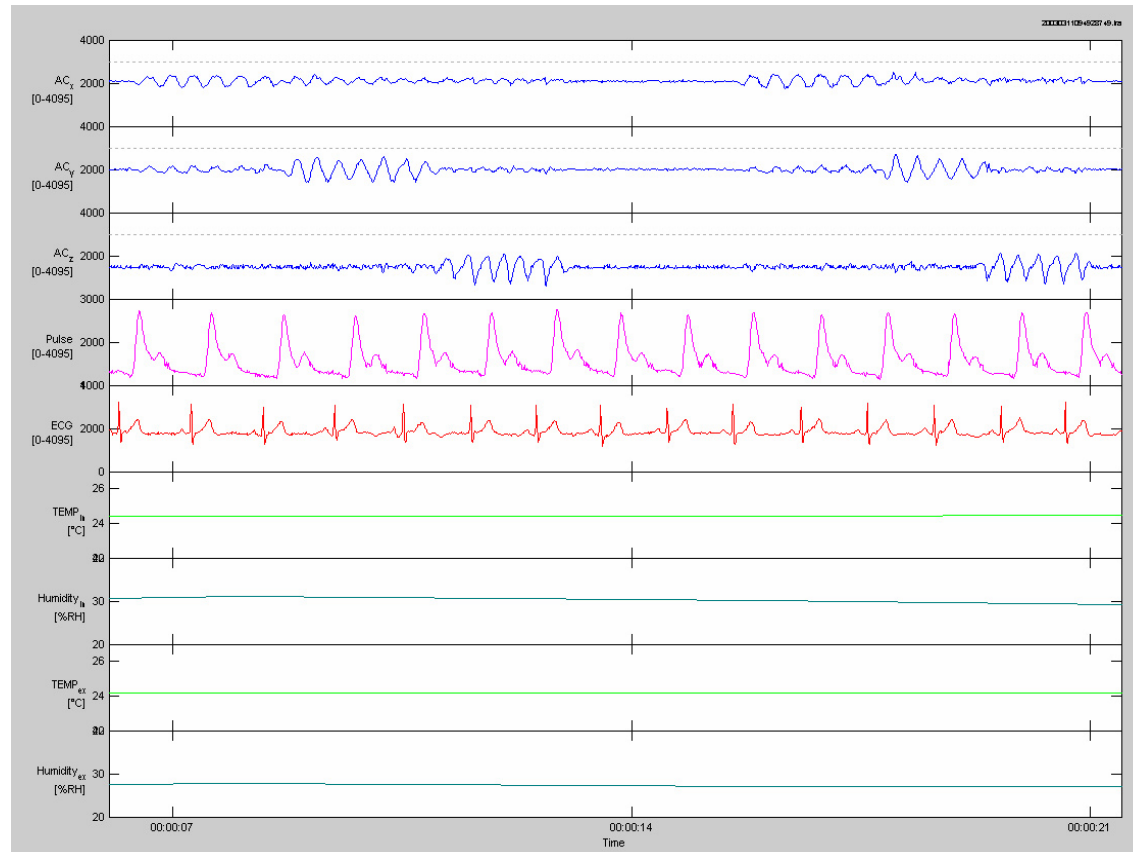


SILC Prototype of Base Station (2002)

- based on modified PC with modem and Bluetooth transmitter
- signal analysing software
- Simple and unified system message structure (XML)
- Interface for environmental control system (infrared and radio frequency for consumer electronic, Konnex for smart home bus)
- In future shrink to embedded system possible
- Prototype chest strap ECG has been developed (gold standard)



Record of different SILC sensors



Sensor signals under laboratory conditions

Results

- Verification Tests (23 elderly users, 9 experts) in Austria and UK
- Prototype system in principle operable and tested but significant limitations (2003):
 - Sensors for pulse need improvement do reduce artefacts.
 - Power consumption needs reduction to achieve 12-24 hours operation.
 - Size and weight to be reduced
- Confirmed of value of concept of wearable alarm unit with monitoring and data and speech communication to service centre

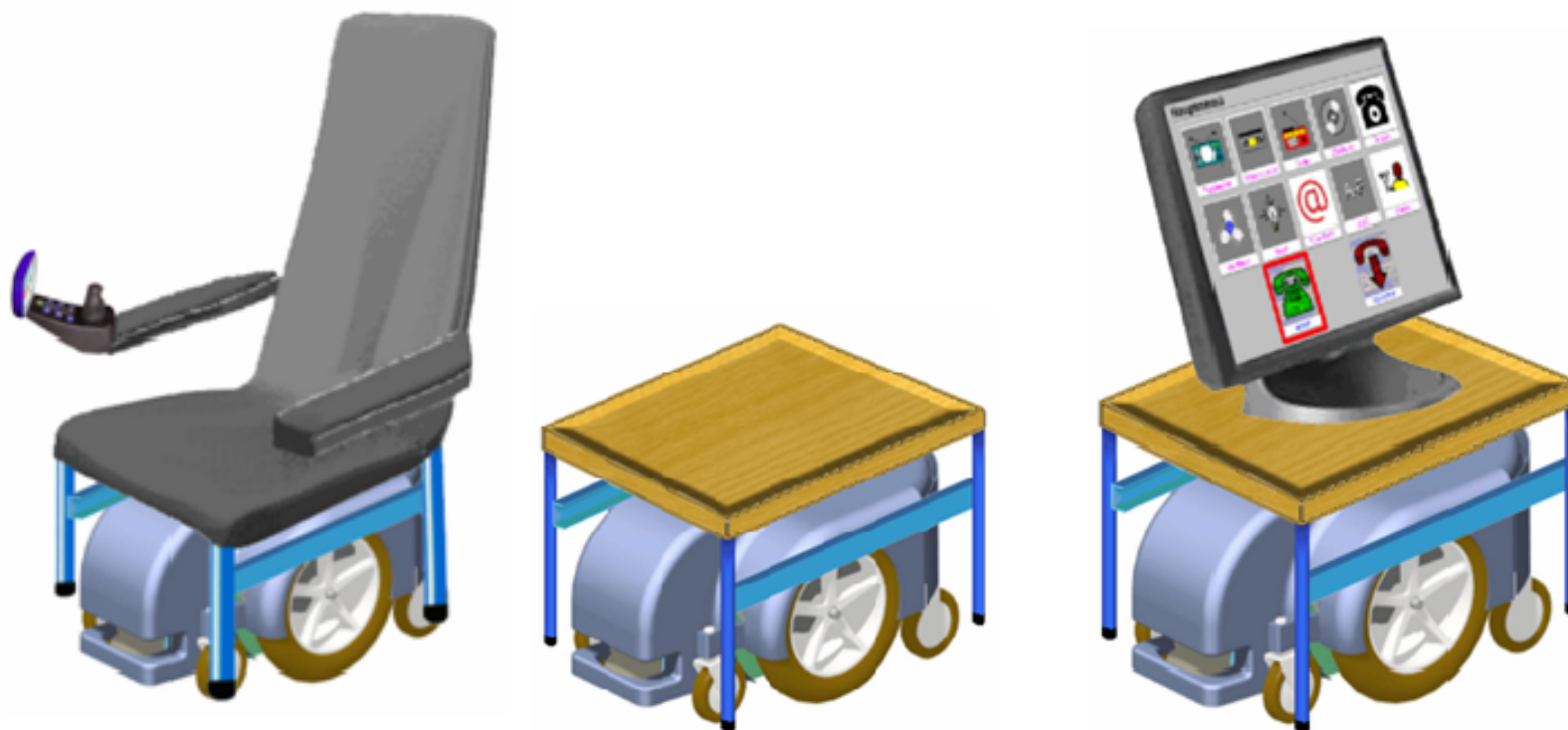
ENABLE (FP6, 2007-2009)

- A wearable system supporting services to ENABLE elderly people to live well, independently and at ease
- The project will develop a **personal, user-centred enabling system**, with services, for use by elderly persons in or out of their homes:
 - *to mitigate the effects of ageing and*
 - *to increase quality of life:*
 - ✓ independence and autonomy,
 - ✓ mobility,
 - ✓ communications and social interaction,
 - ✓ care and safety.

MOVEMENT (FP6, 2004-2007)

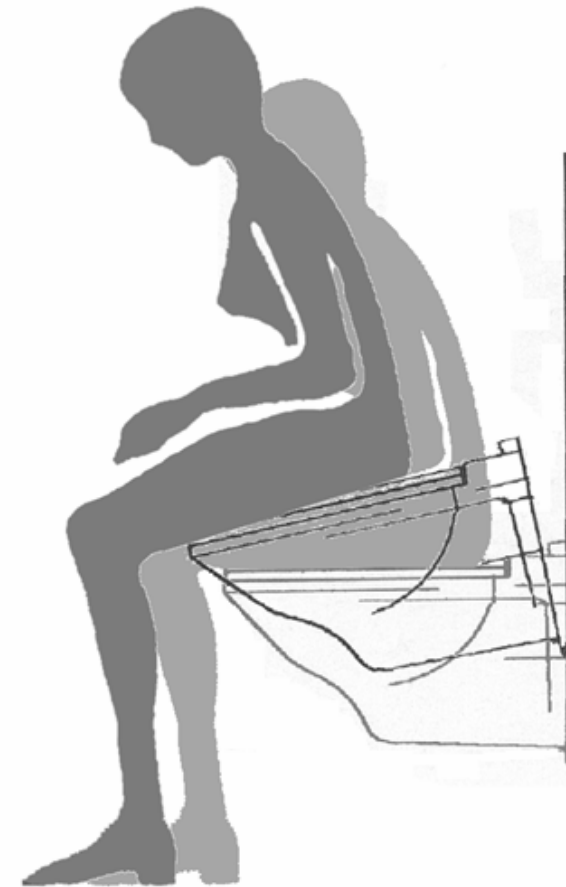
Modular Versatile Mobility Enhancement Technology

Modules for moving people, objects and information



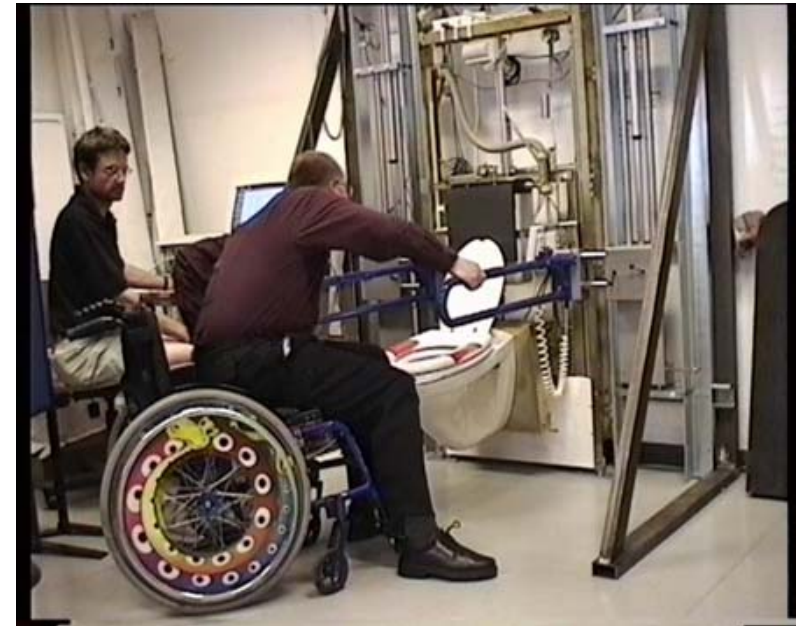
A User Friendly Rest Room - FRR (FP5, 2002-2005) – Role of ICT

- Supportive toilet
- Some components (examples):
 - Adjustability of Tilt and Height of toilet bowl
 - Speech Input and Output
 - Sensors for recognising falls
 - User Identification (RFID)
 - Self adapting to users needs



FRR User Tests 2002 - 2005

- Laboratory: ~ **200 prototype tests with users** in 5 labs in Europe
- Daily Life: ~ **300 toilet sessions** in a day care centre in Vienna



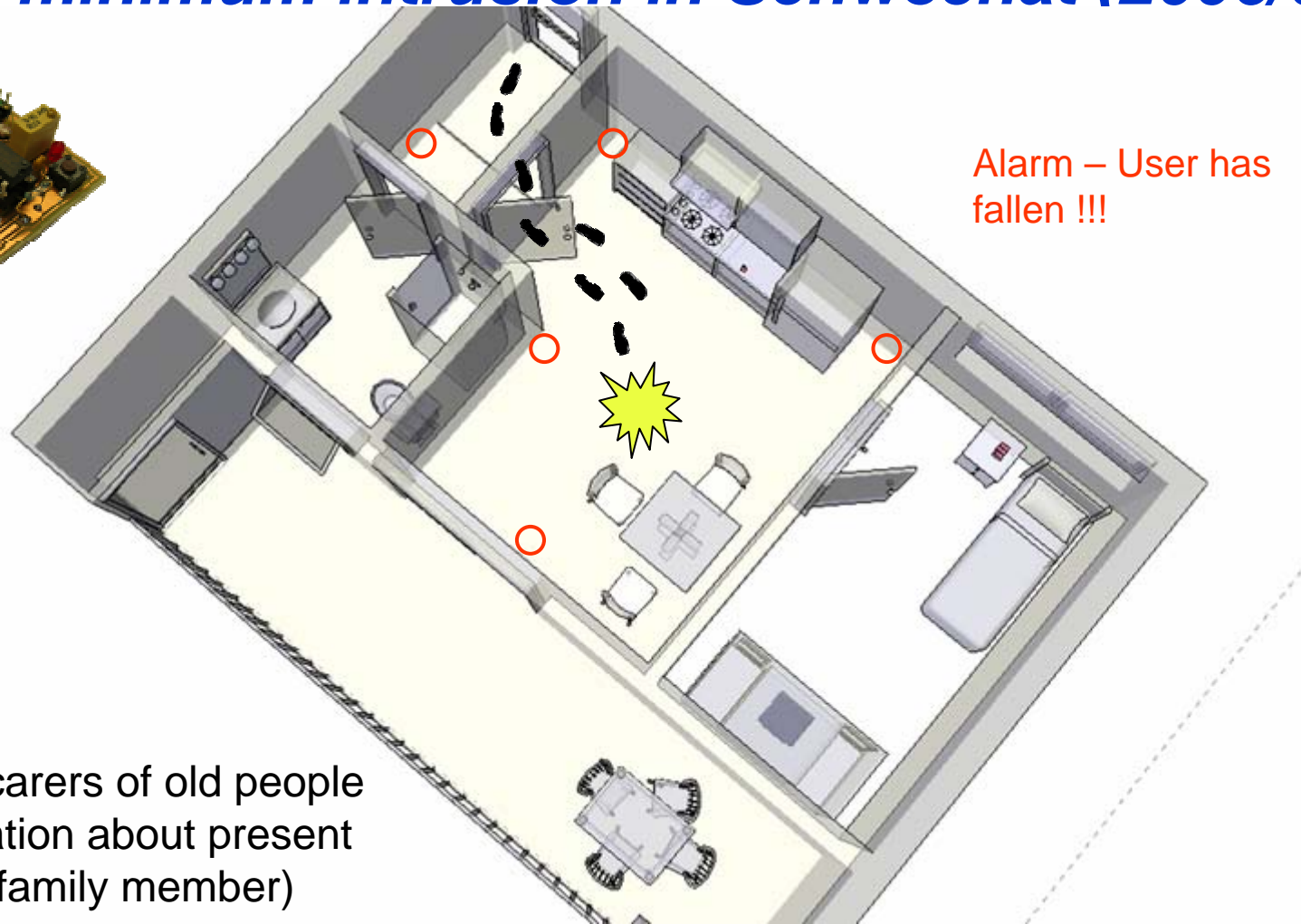
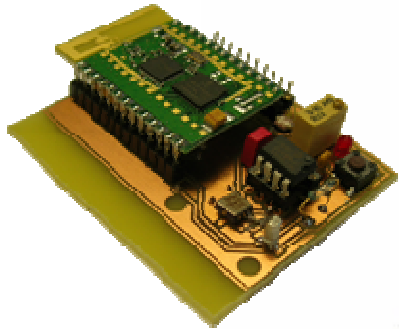
Considerations and ongoing Activities (2007)

- Technological
 - Medical device <> assistive monitoring device
 - **Non intrusive** monitoring and wearable ICT devices applying new types of miniaturized sensors
 - Intuitive Man Machine Interfaces for old persons and their carers
- Interdisciplinary / Methodological:
 - Users are Experts - Intensive Involvement of Users in technological development projects is indispensable
 - Living Framework for Continuous User Involvement & Ethics needed
 - Users Needs and Wants - Offering useful and **wanted** features
 - Envisaged benefits for primary & secondary users – Consider the technical solution as part of the whole complex system

Setting up of an Living Laboratory for Assistive ICT and Older People

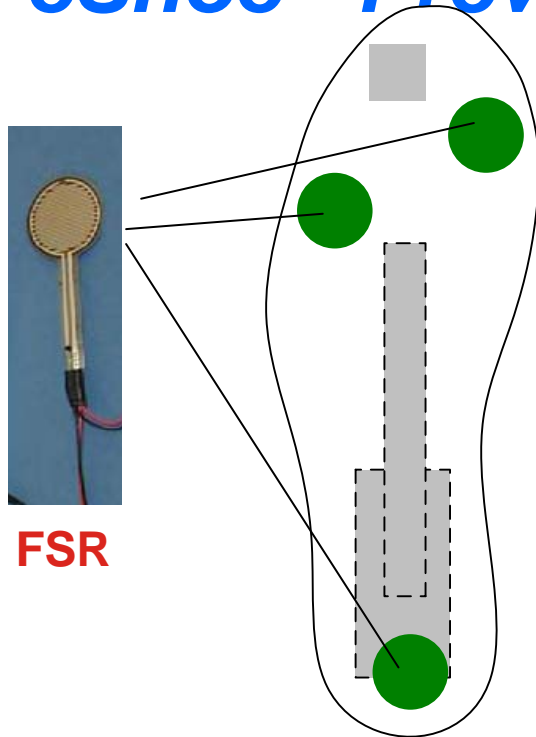
- Living Lab (LL) as framework for involving users (elderly and carers) from the outset
 - Co-creating and exploring ideas,
 - Commenting of prototypes,
 - evaluation of actual benefits in real life setting
- Our Austrian AAL - LL
 - Is located in the city of Schwechat, (Vienna airport area)
 - as part of local initiative “eSchwechat” of the city administration (www.eschwechat.at)
 - first focus on sheltered housing and community care
 - Provides framework for **ethical guidance** and supervision of appropriate involvement of vulnerable users

Pilot Deployment of a ZigBee Sensor Network with minimum intrusion in Schwechat (2006/07)



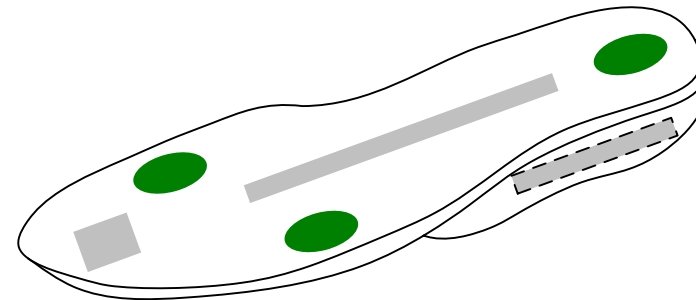
Supporting carers of old people
(tele-information about present
condition of family member)

eShoe - Prevention and detection of falls



FSR

Druckverteilung



FSR = force sensitive resistor, measuring distribution of pressure)

Prevention and detection of falls

Thank you

www.fortec.tuwien.ac.at

Contact



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**CEIT - Central European Institute
of Technology
RALTEC - Rehabilitation and
Assisted Living Technologies**

www.ceit.at

www.eschwechat.at

ICT for Ageing Society – Examples

- FRR – Intelligent Toilet
www.fortec.tuwien.ac.at/frr
- SILC – Extended Emergency Call System
www.fortec.tuwien.ac.at/silc
- ENABLE – Wearable Device
www.fortec.tuwien.ac.at/enable
- Movement – robotic mobility platform
www.fortec.tuwien.ac.at/movement
- AAL – Ambient Assisted Living – Preparing an Article 169 Initiative
www.aal169.org
- Ethics in Assistive Technology
http://www.is.tuwien.ac.at/closetothebody/index_en.html



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 - **EURAG** - European Federation of Older Persons (AT),
 - Laboratory of **Health Informatics** – University of Athens (GR),
 - **Applied Computing** – Dundee University (UK),
 - **Landmark Design Holding** (NL),
 - **Clean Solution Kft** (HU),
 - **SIVA** (IT),
 - **HAGG** – Hellenic Association of Geriatrics and Gerontology (GR)
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